

3.3.6 Oak Savanna Group

The term *savanna* has never been well defined. Cole (1960) summed up the situation this way: "Perhaps of all types of vegetation the savanna is the most difficult to define, the least understood, and the one whose distribution and origin is the most subject to controversy." Today there is still no widely accepted, clear-cut definition of what is meant by savanna.

Most of the information in Section 3.3.6 is reproduced or adapted from "Wisconsin's Biodiversity as a Management Issue" (Addis et al. 1995).

In the Midwest, savanna is generally used to describe an ecosystem that was historically part of a larger complex bordered by the prairies of the west and the deciduous forests of the east. This complex was a mosaic of plant community types that represented a continuum from prairie to forest. Savannas were the communities in the middle of this continuum. The mosaic was maintained by frequent fires and possibly by large ungulates such as elk. Oaks were the dominant trees, hence the term *oak savanna*.

Because savannas grade into both prairie and forest, there are no clear dividing lines between savanna and these two communities. In classifying the plant communities of Wisconsin, Curtis (1959) was forced to set limits for what he called savanna. He ultimately defined it as having no less than one tree per acre and no more than a 50% tree canopy. However, Curtis made it clear that these limits were arbitrary and chosen purely for convenience.

The more wooded part of the historical prairie-forest complex (i.e., savanna or woodlands with 50% - 100% tree canopy) is known to us only through the early accounts of explorers and settlers. This community was already so distorted by lack of fire and other disturbances by the mid-1900s that it was not even classified and studied as a separate community by Curtis and his students. What remained of this community at the time of the Curtis studies (i.e., grown-in savannas) was lumped with the dry or dry-mesic southern hardwood forest communities based on the residual oak trees, often independent of the actual soil moisture regimes of the sites. Recent research is now starting to shed some light on this plant community. Pruksa (1994) studied the sorting out of groundlayer plant species along the natural sunlight gradients found in savanna and woodland.

This more heavily wooded portion of the prairie-forest complex (up to and including 100% closed canopy) might best be described as an open oak woodland. Although much work needs to be done in describing and understanding this community, it should most likely be viewed as separate from oak forest.

In the early to mid-19th century, the oak savanna as an ecosystem was thoroughly fragmented and nearly totally destroyed throughout its range. Most of its acreage suffered one of the following fates: (1) clearing and plowing, (2) overgrazing, or (3) invasion by dense shrub and tree growth due to lack of fire, lack of grazing, or both. Oak savanna now shares equal billing with tallgrass prairie as the most threatened plant community in the Midwest and among the most threatened in the world. Intact examples of oak savanna vegetation are now so rare that less than 500 acres are listed in the Natural Heritage Inventory as having a plant assemblage similar to the original oak savanna. This is less than 0.01% of the original 5.5 million acres.

During the development of the Wisconsin Strategy for Wildlife Species of Greatest Conservation Need, the Oak Savanna Group included the following community types:

- Cedar Glade (Section 3.3.6.1, Page 3-640)
- Oak Opening (Section 3.3.6.2, Page 3-647)
- Oak Woodland (Section 3.3.6.3, Page 3-655)

The vertebrate Species of Greatest Conservation Need in each of the oak savanna communities are presented in the following sections, along with information on opportunities, threats, and priority conservation actions.

Summary of Vertebrate Species
of Greatest Conservation Need
Associated with Oak Savanna
Communities

27 Birds

13 Herptiles

8 Mammals

48 Total Species

3.3.6.1 Cedar Glade

3.3.6.1.1 Community Overview

Curtis (1959) described the cedar glade community as a type of savanna. Most cedar glades occur on steep, dry sandstone, quartzite, rhyolite, or dolomite bluffs. The dominant tree is eastern red cedar, which may occur as scattered trees or shrubs, or, in thickets, interspersed with prairie-like openings. Red maple, paper birch and black and bur oaks may also be present. Apart from rocky bluffs, cedar glade may also occur on very dry, gravelly slopes on south- or west-facing morainal ridges, or on coarse-textured sandy terraces along major rivers in western Wisconsin.

Today's dense "cedar thickets" are usually, if not always, the result of fire suppression on dry prairies. Prior to European settlement the cedar glade may have occurred only where extensive cliffs, rivers, or lakes served as firebreaks. Common herbs include native bluestem and grama grasses, prickly-pear cactus, flowering spurge, stiff sandwort, and gray goldenrod. The associated flora strongly resembles those of the dry prairie and sand prairie communities, with elements of dry cliff, oak barrens, and oak openings also present.

A variant of this community that is dominated by northern white cedar, rather than the eastern red cedar typically associated with cedar glades, has been included in the Wisconsin Strategy for Species of Greatest Conservation Need. Cedar glades dominated by northern white cedar are most prevalent in northeast Wisconsin, especially in Door County. Unlike the "eastern red cedar glades", "northern white cedar glades" are not the result of fire suppression on dry prairies. Instead, they occur in areas where dolomite bedrock is exposed or thinly covered by soil. These "northern white cedar glades" may also have openings interspersed among the white cedar with characteristics similar to alvar, boreal rich fen, dry cliff, or moist cliff communities.

3.3.6.1.2 Vertebrate Species of Greatest Conservation Need Associated with Cedar Glade

Twelve vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with cedar glade (Table 3-133).

Table 3-133. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with cedar glade communities.

| <i>Species Significantly Associated with Cedar Glade</i> |
|---|
| Birds |
| Field Sparrow |
| Lark Sparrow |
| Herptiles |
| Ornate Box Turtle |
| Northern Prairie Skink |
| Prairie Racerunner |
| Western Worm Snake |
| Yellow-bellied Racer |
| Prairie Ringneck Snake |
| Black Rat Snake |
| Bullsnake |
| Timber Rattlesnake |
| <i>Species Moderately Associated with Cedar Glade</i> |
| Herptiles |
| Blanding's Turtle |


In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-133 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both cedar glade and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:


- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of cedar glade in each of the Ecological Landscapes (Tables 3-134 and 3-135).
- Using the analysis described above, a species was further selected if it had both a significant association with cedar glade and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of cedar glade. These species are shown in Figure 3-30.


Table 3-134. Vertebrate Species of Greatest Conservation Need that are (or historically were) significantly associated with cedar glade communities and their association with Ecological Landscapes that support cedar glade.

| Cedar Glade | Birds (2)* | | Herptiles (9) | | | | | | | | |
|--------------------------------|---------------|--------------|-------------------|------------------------|--------------------|--------------------|----------------------|------------------------|-----------------|-----------|--------------------|
| | Field Sparrow | Lark Sparrow | Ornate Box Turtle | Northern Prairie Skink | Prairie Racerunner | Western Worm Snake | Yellow-bellied Racer | Prairie Ringneck Snake | Black Rat Snake | Bullsnake | Timber Rattlesnake |
| MAJOR | | | | | | | | | | | |
| Western Coulee and Ridges | | | | | | | | | | | |
| IMPORTANT | | | | | | | | | | | |
| Northern Lake Michigan Coastal | | | | | | | | | | | |
| Southeast Glacial Plains | | | | | | | | | | | |
| Western Prairie | | | | | | | | | | | |
| PRESENT (MINOR) | | | | | | | | | | | |
| Central Lake Michigan Coastal | | | | | | | | | | | |
| Central Sand Hills | | | | | | | | | | | |
| Central Sand Plains | | | | | | | | | | | |
| Southwest Savanna | | | | | | | | | | | |

Color Key

 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape




 = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-135. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with cedar glade communities and their association with Ecological Landscapes that support cedar glade.

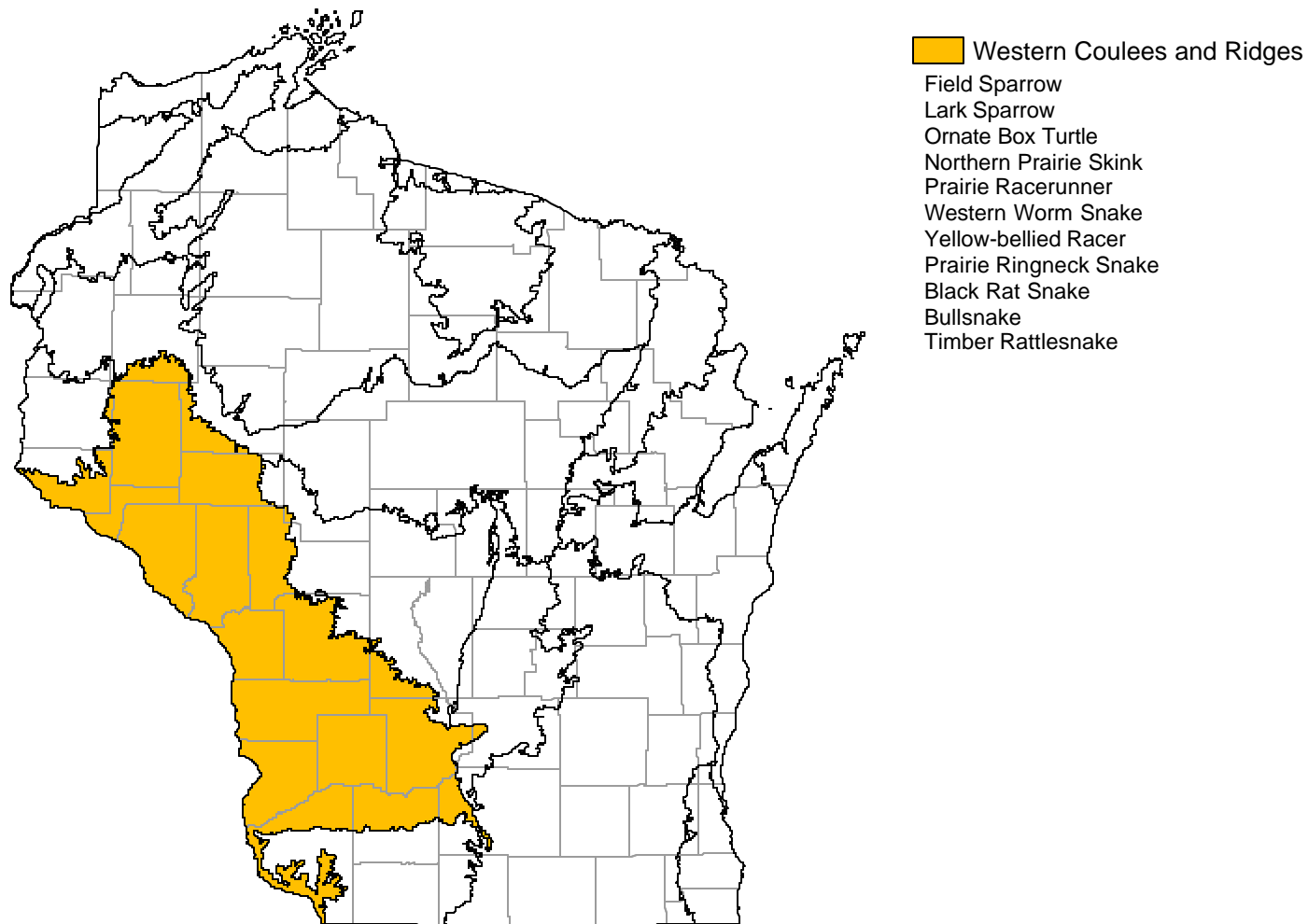
| Cedar Glade | | Herptiles (1)* |
|---|-------------------|----------------|
| Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type | Blanding's Turtle | |
| MAJOR | | |
| Western Coulee and Ridges | | |
| IMPORTANT | | |
| Northern Lake Michigan Coastal | | |
| Southeast Glacial Plains | | |
| Western Prairie | | |
| PRESENT (MINOR) | | |
| Central Lake Michigan Coastal | | |
| Central Sand Hills | | |
| Central Sand Plains | | |
| Southwest Savanna | | |

Color Key

-  = HIGH probability the species occurs in this Ecological Landscape
-  = MODERATE probability the species occurs in this Ecological Landscape
-  = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-30. Vertebrate Species of Greatest Conservation Need that have both a significant association with cedar glade and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of cedar glade.



3.3.6.1.3 Threats and Priority Conservation Actions for Cedar Glade

3.3.6.1.3.1 Statewide Overview of Threats and Priority Conservation Actions for Cedar Glade

The following list of threats and priority conservation actions were identified for cedar glade in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.6.1.3.2 unless otherwise indicated.

Threats and Issues

- The origin, successional pathway, and management needs of this community type are not well understood. Cedar glades have remained relatively undisturbed because they occupy land too steep for most other uses.
- Limited grazing of cedar glades occurs in some parts of the state, which may favor the increase of eastern red cedar.
- There may be a threat from increasing rural housing development on bluff tops overlooking large rivers in western Wisconsin and on gravelly ridges in the Kettle Moraine area of southeastern Wisconsin, both important settings for this community.
- Cedar glades have probably increased in extent from pre-settlement levels at the expense of dry prairie, because fire suppression has favored the increase and spread of eastern red cedar and associated woody species instead of prairie grasses and forbs. This increase should be viewed as temporary, as cedar thickets should not be equated with “glades”.
- Control, even elimination, of eastern red cedar is sometimes an objective of grassland and savanna managers, as this tree has some invasive properties and can suppress the much more highly threatened prairie vegetation. Heavy growths of eastern red cedar can also reduce habitat suitability for sensitive grassland animals, many of which are declining significantly. Glade management probably requires a mix of mechanical removal of woody vegetation and prescribed burning, as eastern red cedar is not a fire resistant species.

Priority Conservation Actions

- More information is needed to understand the origin, successional pathways, conservation benefits, and needs for management of this community type. This community type may not require many conservation actions to sustain it at this time, but should be provided for in areas of historic occurrence; especially on some of the rocky bluffs in southwestern Wisconsin.
- Conflicts with grassland management should be resolved thoughtfully during conservation planning.
- Limiting housing developments on bluff tops in southwestern Wisconsin, especially in areas overlooking major rivers, would maintain conservation options.
- Restricting grazing from glade habitats, especially steep areas, may also help.
- Invasive species issues involve species and challenges similar to those associated with the management of dry prairie, sand prairie, and oak barrens communities.
- A more thorough evaluation of cedar glade is needed in some areas (e.g., along the Niagara Escarpment in the Central Lake Michigan Coastal Ecological Landscape, along the bluffs bordering the St. Croix River in the Western Prairie Ecological Landscape, and in the southern Kettle Moraine region).

3.3.6.1.3.2 Additional Considerations for Cedar Glade by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of cedar glade exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for cedar glade found in Section 3.3.6.1.3.1.

Additional Considerations for Cedar Glade in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Cedar Glade

Western Coulee and Ridges

This Ecological Landscape has the best opportunity for maintaining this community type, especially along the steep bluffs of the Wisconsin, Chippewa, Black, and Mississippi Rivers, and locally, along some of the sandy terraces flanking those rivers. Occurrences of this type are found at Blue River Sand Prairie State Natural Area (Iowa County), North Bend Bottoms State Wildlife Area (La Crosse County), Badger Army Ammunition Plant (Sauk County), Devil's Lake State Park (Sauk County), and Brady's Bluff State Natural Area (Trempealeau County).

Additional Considerations for Cedar Glade in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Cedar Glade

Northern Lake Michigan Coastal

Areas of cedar glade with eastern red cedar as the dominant tree species do occur in this Ecological Landscape, but they are not very prevalent. A variant of this community that is dominated by northern white cedar is more common in this landscape, especially in Door County. Northern white cedar glades are associated with areas where dolomite bedrock is exposed or thinly covered by soil. Deer browse is impacting the regeneration of northern white cedar and threatens the longterm persistence of this community type. Northern white cedar glades often intergrade with other communities associated with calcareous substrate such as alvar, boreal rich fen, dry cliff, and moist cliff. Management for northern white cedar glades should occur within the context of these larger community complexes.

Southeast Glacial Plains

This type is found on gravelly glacial moraines, where waterbodies, wetlands, or other features historically offered some protection from fire. Examples of this type in this Ecological Landscape can be found in the Southern Unit of the Kettle Moraine State Forest, Muralt Prairie State Natural Area (Green County), and at a few locations along the Niagara Escarpment. Cedar glade communities should be maintained where ecologically appropriate, and where this goal does not conflict with important opportunities to manage for open grasslands.

Western Prairie

Limited areas of cedar glade occur on steep bluffs along the St. Croix, Apple, and Kinnickinnic Rivers. This type needs additional evaluation in this Ecological Landscape.

3.3.6.2 Oak Opening

3.3.6.2.1 Community Overview

As defined by Curtis, this is an oak-dominated savanna community in which there is less than 50% tree canopy coverage. Historically, oak openings were very abundant and occurred on wet-mesic to dry sites. Today, very few examples of this type exist. The few extant remnants are mostly on drier sites, with the mesic and wet-mesic oak openings almost totally destroyed by conversion to agricultural or residential uses, and by the encroachment of other woody plants due to fire suppression. Bur, white, and black oaks are dominant in mature stands, typically as large, open-grown trees with distinctive limb architecture. Shagbark hickory is sometimes present. American hazelnut is a common understory shrub. The herb layer is similar to those found in oak forests and prairies, with many of the same grasses and forbs present. There are some plants and animals that reach their optimal abundance in the openings (e.g., red-headed woodpecker, orchard oriole, eastern bluebird, kittentails).

3.3.6.2.2 Vertebrate Species of Greatest Conservation Need Associated with Oak Opening

Twenty-five vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with oak opening (Table 3-136).

Table 3-136. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with oak opening communities.

| <i>Species Significantly Associated with Oak Opening</i> |
|--|
| Birds Red-headed Woodpecker Brown Thrasher Field Sparrow Herptiles Blanding's Turtle Ornate Box Turtle Northern Prairie Skink Prairie Racerunner Prairie Ringneck Snake Bullsnake Timber Rattlesnake Mammals Franklin's Ground Squirrel Woodland Vole |
| <i>Species Moderately Associated with Oak Opening</i> |
| Birds Greater Prairie-chicken Northern Bobwhite Barn Owl Blue-winged Warbler Vesper Sparrow Henslow's Sparrow Eastern Meadowlark Herptiles Wood Turtle Western Slender Glass Lizard Black Rat Snake Mammals Eastern Red Bat White-tailed Jackrabbit Prairie Vole |

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-136 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both oak opening and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of oak opening in each of the Ecological Landscapes (Tables 3-137 and 3-138).
- Using the analysis described above, a species was further selected if it had both a significant association with oak opening and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of oak opening. These species are shown in Figure 3-31.

Table 3-137. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with oak opening communities and their association with Ecological Landscapes that support oak opening.

| Oak Opening | Birds (3)* | | | Herptiles (7) | | | | | | | Mammals (2) | |
|--------------------------------|-----------------------|----------------|---------------|-------------------|-------------------|------------------------|--------------------|------------------------|-----------|--------------------|----------------------------|---------------|
| | Red-headed Woodpecker | Brown Thrasher | Field Sparrow | Blanding's Turtle | Ornate Box Turtle | Northern Prairie Skink | Prairie Racerunner | Prairie Ringneck Snake | Bullsnake | Timber Rattlesnake | Franklin's Ground Squirrel | Woodland Vole |
| MAJOR | | | | | | | | | | | | |
| Southeast Glacial Plains | | | | | | | | | | | | |
| Southwest Savanna | | | | | | | | | | | | |
| Western Coulee and Ridges | | | | | | | | | | | | |
| IMPORTANT | | | | | | | | | | | | |
| Southern Lake Michigan Coastal | | | | | | | | | | | | |
| Western Prairie | | | | | | | | | | | | |
| PRESENT (MINOR) | | | | | | | | | | | | |
| Central Sand Hills | | | | | | | | | | | | |

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-138. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with oak opening communities and their association with Ecological Landscapes that support oak opening.

| Oak Opening | Birds (7)* | | | | | | | Herptiles (3) | | | Mammals (3) | | |
|--------------------------------|-------------------------|-------------------|----------|---------------------|----------------|-------------------|--------------------|---------------|------------------------------|-----------------|-----------------|-------------------------|--------------|
| | Greater Prairie-Chicken | Northern Bobwhite | Barn Owl | Blue-winged Warbler | Vesper Sparrow | Henslow's Sparrow | Eastern Meadowlark | Wood Turtle | Western Slender Glass Lizard | Black Rat Snake | Eastern Red Bat | White-tailed Jackrabbit | Prairie Vole |
| MAJOR | | | | | | | | | | | | | |
| Southeast Glacial Plains | | | | | | | | | | | | | |
| Southwest Savanna | | | | | | | | | | | | | |
| Western Coulee and Ridges | | | | | | | | | | | | | |
| IMPORTANT | | | | | | | | | | | | | |
| Southern Lake Michigan Coastal | | | | | | | | | | | | | |
| Western Prairie | | | | | | | | | | | | | |
| PRESENT (MINOR) | | | | | | | | | | | | | |
| Central Sand Hills | | | | | | | | | | | | | |

Color Key

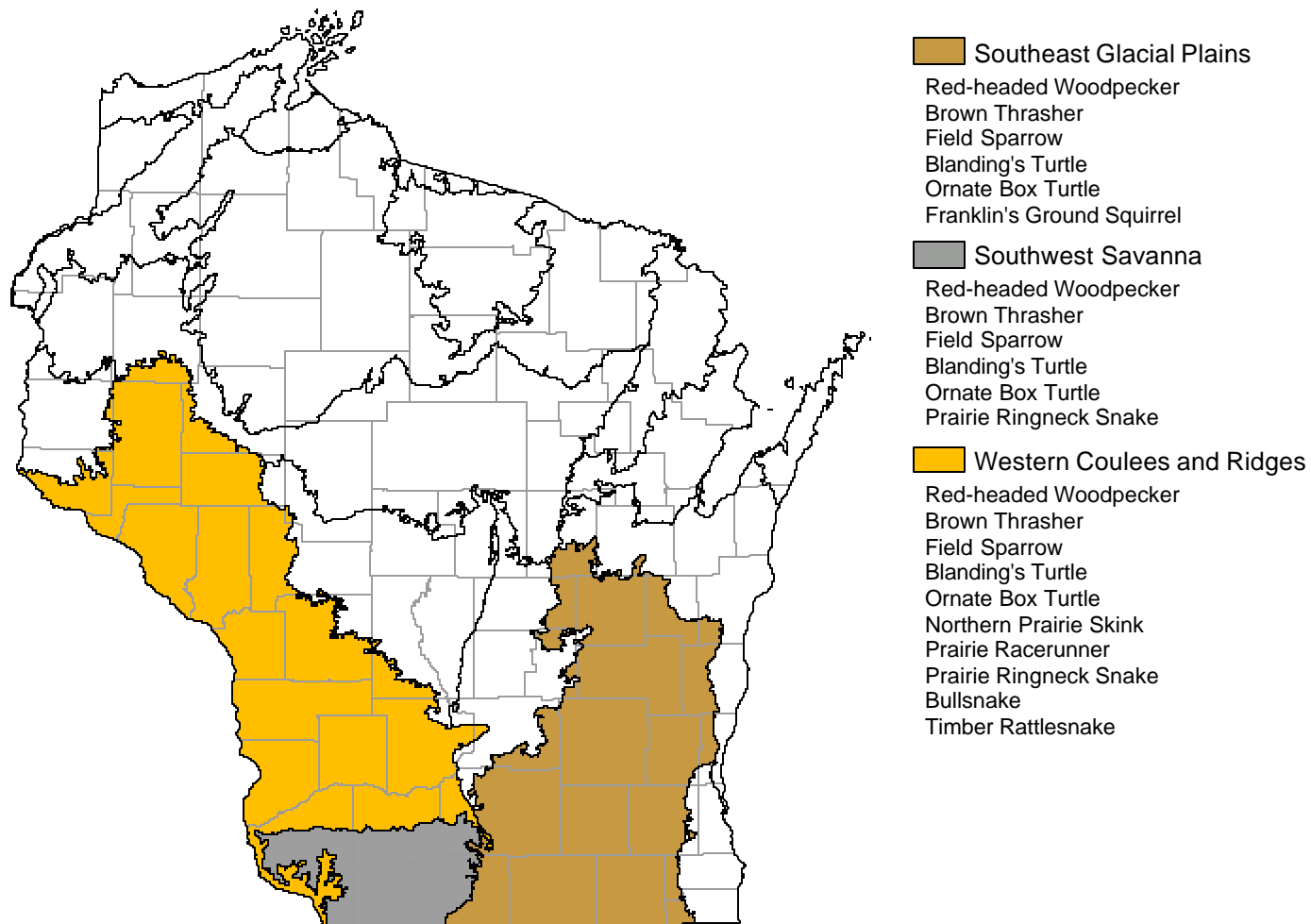
= HIGH probability the species occurs in this Ecological

= MODERATE probability the species occurs in this Ecological

= LOW or NO probability the species occurs in this Ecological

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-31. Vertebrate Species of Greatest Conservation Need that have both a significant association with oak opening and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of oak opening.



3.3.6.2.3 Threats and Priority Conservation Actions for Oak Opening

3.3.6.2.3.1 Statewide Overview of Threats and Priority Conservation Actions for Oak Opening

The following list of threats and priority conservation actions were identified for oak opening in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.6.2.3.2 unless otherwise indicated.

Threats and Issues

- The community type is globally rare.
- The few existing remnants are small, overgrown, and often isolated.
- Composition and structure are often not balanced on most remnants, either because they are overgrown, or lack understory and/or oak regeneration due to prolonged periods of past grazing.
- Lack of fire allows rapid succession to closed forest.
- Intense and/or frequent burning may have negative impacts on fire-sensitive invertebrates or other species (e.g., when habitat remnants are small, isolated, topographically uniform, and have very high fuel loads).
- Invasive plants such as exotic buckthorns, honeysuckles, and multiflora rose are serious threats.
- Grazing can eliminate understory plant species, limit oak regeneration, and encourage the spread of invasives.
- The native invasive, prickly ash, is a problem in grazed stands and can create impenetrable monotypic thickets.
- Rural housing causes fragmentation of restorable stands and may limit options for prescribed burning.
- Small patch size is a problem for some species; research is needed on the range of patch sizes that will sustain the full complement of associated animals.
- Gypsy moth may impact oaks in this community type.
- High deer densities can impact oak regeneration and understory composition.
- Unsustainable forest community management practices such as high grading or removing open-grown oaks as non premier lumber trees are detrimental to this community.
- Conflicts sometime exist with forest or grassland objectives. Effective resolution may be dependent on both site level and landscape level perspectives.
- There is a lack of specific information on the location and abundance of restorable sites in some Ecological Landscapes.
- More information is needed to manage the full range of natural variability associated with this dynamic community type.

Priority Conservation Actions

- Conservation will depend largely on restoration.
- Information is scarce because intact examples of the type are so rare they cannot be well-studied.
- Research is needed to develop additional restoration techniques. These techniques should be applied where appropriate.
- Conduct additional survey work in certain landscapes to identify restorable sites.
- This type requires active management, and, where possible, should be managed in the context of dry oak forest, oak woodland, and savanna in a gradient from closed forest to open grassland.
- Develop educational tools and demonstration areas that promote the benefits of prescribed fire, and address the public's fears and liability concerns.
- Follow existing screening guidance and management guidelines for prescribed burning to minimize negative impacts to sensitive species.

- Develop practical “toolkit” for regenerating oak in a savanna context and display in demonstration areas for public.
- Monitor to ensure oak regeneration success and appropriate herb response, and follow up with additional management as needed.
- Provide cost sharing incentives to burn and/or regenerate oak.
- Limited grazing can be used to manage the structure of this community to accommodate a variety of birds, using care not to eliminate palatable native plants.
- Reduce deer density.
- Continue and support research to find biocontrols for invasives; control spread of new invasives.
- Restoration potential for oak openings exists in the Central Sand Hills and Central Sand Plains Ecological Landscapes, but further evaluation is needed to determine feasibility and extent of the opportunities.

3.3.6.2.3.2 Additional Considerations for Oak Opening by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of oak opening exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for oak opening found in Section 3.3.6.2.3.1.

Additional Considerations for Oak Opening in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Oak Opening

Southeast Glacial Plains

The Southern Unit of the Kettle Moraine State Forest offers some of the best management and restoration opportunities in the upper Midwest, including Eagle Oak Opening (Waukesha County). Other good examples occur at Lulu Lake State Natural Area (Walworth County).

Southwest Savanna

More refined boundary information is needed. There are pastured savannas here that have never been plowed that have characteristic structural features, and may have retained at least some important understory components.

Western Coulees and Ridges

There are many overgrown sites and restoration opportunities are excellent in this Ecological Landscape. Some examples of this type are found at Avoca Prairie-Savanna (Iowa County), Red Cedar River Savanna State Natural Area and Caryville Savanna (Dunn County), and Lower Chippewa River State Natural Area (Buffalo, Dunn, Trempealeau Counties). Inventory projects that are designed to reveal priority restoration sites would likely yield positive results in this EL.

Additional Considerations for Oak Opening in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Oak Opening

Southern Lake Michigan Coastal

Several Milwaukee County Parks and a few other public lands (e.g., Chiwaukee Prairie State Natural Area in Kenosha County) have small-scale opportunities to manage for this community type.

Western Prairie

Some of the Waterfowl Production Areas and Wildlife Areas in this Ecological Landscape (e.g., Oak Ridge Lake Waterfowl Production Area in St. Croix County) offer restoration potential for this community type.

3.3.6.3 Oak Woodland

3.3.6.3.1 Community Overview

The oak woodland community occupies a position on the vegetation continuum that is intermediate between the oak savannas (especially oak openings) and the oak forests (especially southern dry forest). Oak woodland differs from oak savanna types in the limb architecture of its trees (which are **not** characterized by wide, spreading crowns over short thick boles), and greater crown closure (with an approximate range of 50% to as much as 95%). As presently understood, the latter attribute is not simply the result of the canopy closure that affected most savannas following the implementation of wildfire suppression policies earlier in the twentieth century. As soon as fire suppression policies were widely implemented in southern Wisconsin, the rapid proliferation of shrubs and saplings would have quickly altered stand structure, causing the open understories of the oak woodland communities to disappear. Describing the differences between woodland and forest is difficult because of the absence of intact reference stands, but the oak woodland was subjected to frequent (annual) wildfires of low intensity, lacked the dense woody understory that characterizes most oak forests, and often had relatively lower canopy closure than true forest.

Dominant trees included white oak, bur oak, and black oak, sometimes mixed with red oak and shagbark hickory. The denser growth of trees did not allow for the exaggerated crown spread demonstrated by oaks in true savannas (which in a natural state would usually exhibit less than 50% canopy cover). Under a characteristic fire regime, shrub and sapling representation in oak woodlands would be minimal. The herb layer is potentially diverse, including some members of the prairie, oak savanna, and oak forest communities, but also featuring grasses, legumes, composites and other forbs that are best adapted to light conditions of high filtered shade. Representative herbs are thought to include upland boneset, violet bush-clover, Virginia bush-clover, Culver's-root, rough-leaved sunflower, Eastern shooting-star, Short's aster, pimpernel, bottlebrush grass, silky wild-rye, and bracted tick-trefoil.

Many of the same plants and animals that reach their optimal abundance in the oak openings also occur in oak woodland, including red-headed woodpecker, orchard oriole, eastern bluebird, and kittentails. Oak woodland can also support forest species, such as yellow-throated vireo, scarlet tanager, tufted titmouse, and blue-gray gnatcatcher, and in large stands, some species that are restricted to forest interior conditions, such as the cerulean warbler.

The geographic range historically occupied by oak woodland would be virtually the same as that of oak openings and prairies in southern Wisconsin. Oak woodland would have been most common on sites that experienced frequent, low-intensity ground fires. Moisture conditions would have included dry, dry-mesic, mesic, and, possibly, wet-mesic sites. Today oak woodland is most likely to occur in those parts of southern Wisconsin that continue to support relatively large areas of natural vegetation that include prairie and savanna remnants in proximity to oak-dominated forests. Portions of the Driftless Area, the kettle interlobate moraine of southeastern Wisconsin, and perhaps portions of the Central Sand Hills, offer the best potential. This type is extraordinarily rare today.

3.3.6.3.2 Vertebrate Species of Greatest Conservation Need Associated with Oak Woodland

Seventeen vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with oak woodland (Table 3-139).

Table 3-139. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with oak woodland communities.

| Species Significantly Associated with Oak Woodland | |
|---|----------------------------|
| Birds | |
| | Whip-poor-will |
| | Red-headed Woodpecker |
| Herptiles | |
| | Ornate Box Turtle |
| | Black Ratsnake |
| | Bullsnake |
| | Timber Rattlesnake |
| Mammals | |
| | Woodland Vole |
| Species Moderately Associated with Oak Woodland | |
| Birds | |
| | Wood Thrush |
| | Blue-winged Warbler |
| | Cerulean Warbler |
| Herptiles | |
| | Wood Turtle |
| | Blanding's Turtle |
| | Northern Prairie Skink |
| | Prairie Ringneck Snake |
| Mammals | |
| | Northern Long-eared Bat |
| | Eastern Red Bat |
| | Franklin's Ground Squirrel |


In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-139 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both oak woodland and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:


- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of oak woodland in each of the Ecological Landscapes (Tables 3-140 and 3-141).
- Using the analysis described above, a species was further selected if it had both a significant association with oak woodland and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of oak woodland. These species are shown in Figure 3-32.


Table 3-140. Vertebrate Species of Greatest Conservation Need that are (or historically were) significantly associated with oak woodland communities and their association with Ecological Landscapes that support oak woodland.

| Oak Woodland Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type | Birds (2)* | | Herptiles (4) | | | | Mammals (1) |
|--|----------------|-----------------------|-------------------|-----------------|-----------|--------------------|---------------|
| | Whip-poor-will | Red-headed Woodpecker | Ornate Box Turtle | Black Rat Snake | Bullsnake | Timber Rattlesnake | Woodland Vole |
| MAJOR | | | | | | | |
| Southeast Glacial Plains | | | | | | | |
| Southwest Savanna | | | | | | | |
| Western Coulee and Ridges | | | | | | | |
| IMPORTANT | | | | | | | |
| Western Prairie | | | | | | | |
| PRESENT (MINOR) | | | | | | | |
| Central Sand Hills | | | | | | | |
| Central Sand Plains | | | | | | | |
| Southern Lake Michigan Coastal | | | | | | | |

Color Key

 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape


 = LOW or NO probability the species occurs in this Ecological Landscape


* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.


Table 3-141. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with oak woodland communities and their association with Ecological Landscapes that support oak woodland.

| Oak Woodland Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type | Birds (3)* | | | Herptiles (4) | | | | Mammals (3) | | |
|--|-------------|---------------------|------------------|---------------|-------------------|------------------------|------------------------|-------------------------|-----------------|----------------------------|
| | Wood Thrush | Blue-winged Warbler | Cerulean Warbler | Wood Turtle | Blanding's Turtle | Northern Prairie Skink | Prairie Ringneck Snake | Northern Long-eared Bat | Eastern Red Bat | Franklin's Ground Squirrel |
| MAJOR | | | | | | | | | | |
| Southeast Glacial Plains | | | | | | | | | | |
| Southwest Savanna | | | | | | | | | | |
| Western Coulee and Ridges | | | | | | | | | | |
| IMPORTANT | | | | | | | | | | |
| Western Prairie | | | | | | | | | | |
| PRESENT (MINOR) | | | | | | | | | | |
| Central Sand Hills | | | | | | | | | | |
| Central Sand Plains | | | | | | | | | | |
| Southern Lake Michigan Coastal | | | | | | | | | | |

Color Key

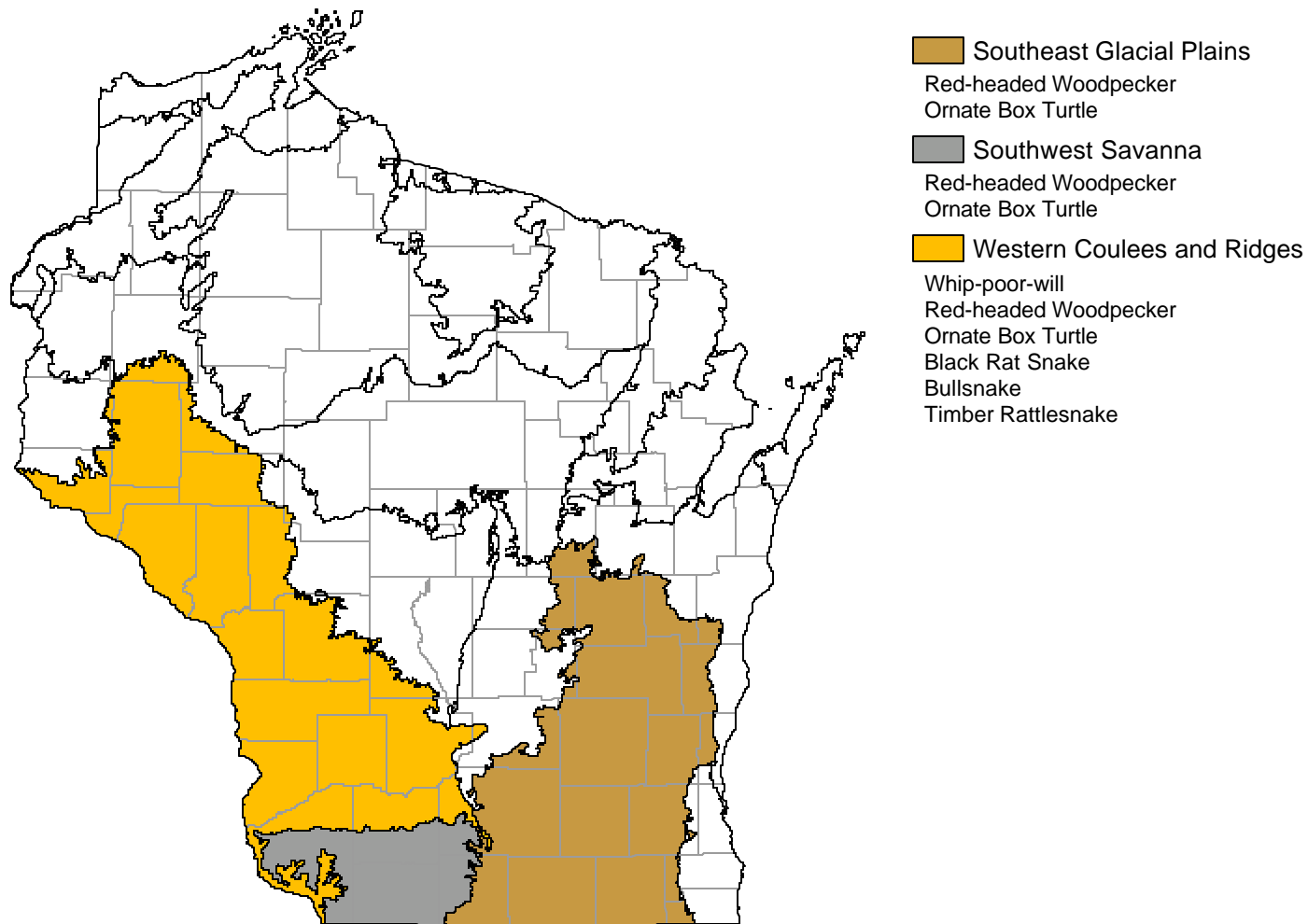
 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape

 = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-32. Vertebrate Species of Greatest Conservation Need that have both a significant association with oak woodland and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of oak woodland.



3.3.6.3.3 Threats and Priority Conservation Actions for Oak Woodland

3.3.6.3.3.1 Statewide Overview of Threats and Priority Conservation Actions for Oak Woodland

The following list of threats and priority conservation actions were identified for oak woodland in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.6.3.3.2 unless otherwise indicated.

Threats and Issues

- Lack of information on this type is a major threat, as management that would be appropriate for either a savanna or oak forest would not maintain all of an oak woodland's distinctive attributes.
- The few existing occurrences are small, overgrown, and often isolated.
- Composition and structure have been altered by long periods of fire suppression, resulting in serious encroachment by woody species.
- Lack of fire is a major threat; however, intense and/or frequent burning may have negative impacts on fire-sensitive invertebrates or other species (e.g., when habitat remnants are small, isolated, topographically uniform, and have very high fuel loads).
- Invasive plants such as exotic buckthorns, honeysuckles, garlic mustard, and multiflora rose are major threats throughout southern Wisconsin.
- Grazing can eliminate sensitive native understory plant species and encourage the spread of invasives, including thorny shrubs such as the native prickly ash.
- Gypsy moth may impact oaks in this community type.
- High deer populations may be impacting native understory species.
- Rural housing developments can cause fragmentation of restorable stands and limit options for prescribed burning.
- Small patch size may be a problem for some species that potentially use oak woodlands; more research is needed on the range of patch sizes needed to maintain the full complement of animals associated with this and related types.
- Unsustainable forest community management practices such as high grading or removing open-grown oaks as non premier lumber trees is detrimental to this community.
- Conflicts may exist in some areas with forest or grassland management objectives.

Priority Conservation Actions

- This community type is as rare as the oak savannas that have all but disappeared from Wisconsin's landscape. Conservation will depend largely on restoration. Information is scarce and the type is so rare that it is difficult to conduct in-depth studies over long time periods. Research and experimentation will be critical to enable the development of effective restoration and management techniques.
- Demonstration sites are needed to showcase examples of the community, appropriate management, and the context within which this community occurs.
- More survey work is needed to identify the locations of restorable sites. Guidelines that would help inventory staff and managers identify potential oak woodland occurrences are also needed.
- Survey efforts for new sites should include the Central Sand Hills and the Central Sand Plains Ecological Landscapes as well as those listed at the end of this chapter.
- Oak woodland requires active management, and it's doubtful that any means other than prescribed fire would be effective in minimizing shrub and sapling cover while encouraging the growth of native grasses and forbs.
- Oak woodland should be managed in the context of dry oak forest, oak savanna, and grasslands (including but not limited to native prairie).

- Develop educational tools and demonstration areas that promote benefits of prescribed fire, and address the public's liability concerns. Use demonstration areas for professional managers and the public, and develop a practical "toolkit" for regenerating oak at the appropriate time.
- Follow existing screening guidance for prescribed burning to minimize potentially negative impacts to sensitive species.
- Provide cost sharing incentives to land trusts and private landowners to burn and/or regenerate oak.
- Reduce deer density.
- Continue and support research to find biocontrols for invasives; control spread of new invasives.

3.3.6.3.3.2 Additional Considerations for Oak Woodland by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of oak woodland exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for oak woodland found in Section 3.3.6.3.3.1.

Additional Considerations for Oak Woodland in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Oak Woodland

Southeast Glacial Plains

The Southern Unit of the Kettle Moraine State Forest offers some of the best management and restoration opportunities for oak openings and prairies in the upper Midwest. Oak woodland could be incorporated into savanna and prairie restoration projects, thereby providing a fuller representation of the variable conditions formerly characteristic of this region but also providing potentially viable habitat for some of the vulnerable "forest" species in this region. Other potential restoration and management sites occur within the joint TNC-WDNR Mukwonago River Watershed project (Walworth County).

Southwest Savanna

Some of the "pastured but never plowed" oak savanna sites that have been identified in this Ecological Landscape by WDNR Integrated Science Services staff may offer opportunities to restore and manage for savanna and oak woodland types. Additional survey work is needed to clarify the feasibility of initiating projects here.

Western Coulees and Ridges

There are many overgrown oak savanna remnants in this Ecological Landscape and restoration opportunities for both savanna and oak woodland are likely but not yet identified at the site level. Potential examples should be searched for on existing public lands such as Rush Creek Prairie State Natural Area (Crawford County), Fort McCoy Military Reservation (Monroe County), and Lower Chippewa River State Natural Area (Buffalo, Dunn, Trempealeau Counties).

Additional Considerations for Oak Woodland in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Oak Woodland

Western Prairie

Some of the Waterfowl Production Areas and Wildlife Areas in this Ecological Landscape (e.g., Oak Ridge Lake Waterfowl Production Area (St. Croix County)) may offer restoration potential for this community type.